UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING (HBT)
BOSTON, MASSACHUSETTS 02203-2211

March 3, 1998

Mr. Emil Klawitter
Department of the Navy
Northern Division
Naval Facilities Engineering Command
Code 1823/EK
10 Industrial Highway, Mailstop 82
Lester, PA 19113-2090
(eeklawitter@efdnorth.navfac.navy.mil)

Re: Naval Air Station, Brunswick, Maine
1996 Annual Report, Monitoring Events 5 through 7, Sites 1, 3 and the Eastern Plume

Dear Mr. Klawitter:

Thank you for the opportunity to review and comment to the above document which was prepared by EA Engineering, Science and Technology. The U.S. Environmental Protection Agency (EPA) comments are attached. I look forward to discussing these comments and the long term monitoring plan in general at the technical level meeting later this month.

This letter will also be sent by E-mail as an attached file in MS Word version 6.0 to addressees who have an E-mail address indicated. Please call me at 617-223-5579 or E-mail me at barry.michael@epamail.epa.gov for any questions, problems downloading this letter or would like to be added to E-mail distribution.

Sincerely,

MSBarry

Michael S. Barry, Remedial Project Manager
Federal Superfund Facilities Section

Attachment

cc. (by US Mail only unless otherwise indicated)
Jim Caruthers/NASB
Claudia Sait/ME DEP (also by E-mail to claudia.b.sait@state.me.us)
Susan Weddle/BACSE
Carolyn LePage/LePage Environmental (also by E-mail to clepagegeo@aol.com)
Rene Bernier/Topsham Community Rep.
Charles MacLeod/EA Environmental
Jeffery Brandow/ABB-ES
Rayo Bhumgara/Gannett-Fleming (also by E-Mail to rbhumgara@gfnet.com)

ATTACHMENT

The following are the EPA's comments to the *Final 1996 Annual Report, Monitoring Events 5 Through 7, Sites 1 and 3 and Eastern Plume, Naval Air Station, Brunswick, Maine*. This document was also reviewed by Gannett Fleming, Inc. (GF) as part of the EPA's oversight activities.

This report was reviewed for technical accuracy, as well as for adherence to EPA guidance and generally accepted practice. Particular attention was given to the effectiveness of the extraction wells within the Eastern plume in capture of contaminated groundwater and to identifiable, long-term trends in contaminant concentrations measured at monitoring and extraction wells.

General Comments

1. The long time lag of this report, after data from monitoring events 8 and 9 is available, reduces the value of the analysis. For example, the report mentions refers in a general sense to future extraction trials at MW-311 (general comment 3) when that information is now available. Inclusion of the annual analysis with the last monitoring event report of each year would yield much more timely analysis and eliminate the need (and expense) of a separate deliverable. This subject can be visited during discussions about revising the long tem monitoring plan.

2. The extraction wells are generally well located to capture contaminated groundwater in the Eastern plume. Contamination generally appears to be greater in the deeper portion of the aquifer, and in two separate patches in the northernmost and southernmost areas of the plume. The deep groundwater generally appears to flow to the southeast and/or south (e.g., Figs. 3-8 to 3-13). Extraction wells EW-4 and EW-5 are positioned to capture most of the flow passing through the northern patch of contamination in the deep aquifer. These wells show fairly persistent exceedances of 1,1,1-trichloroethane (TCA), trichloroethene (TCE) and the breakdown product 1,1-dichloroethene (1,1-DCE), confirming their effectiveness. Extraction wells EW-1 and EW-2 are positioned to capture much of the flow through the southern patch of contamination, and show persistent exceedances of tetrachloroethene (PCE) and TCE.

3. An exception to the success of the extraction wells in capturing contamination is the area around monitoring well MW-311, where there have been persistent high concentrations of chlorinated volatile organic compounds (VOCs), particularly TCA, TCE and their breakdown products. This area, drawn as a lobe on the southern patch protruding to the east in Figures 3-17 to 3-19, is downgradient of extraction well EW-2, and probably beyond its region of influence (see Specific Comment 1). It is understood that an additional extraction well is planned for the area near MW-311 to capture this portion of the plume. This action is strongly supported by the monitoring data to date.

4. In the long term, monitoring well EW-3 can be expected to be less effective than the others in removing contaminants from the most contaminated areas of the plume, because it lies on the upgradient edge of the southern patch of exceedances. It will continue to draw to a limited extent from the area to the southeast, but primarily will intercept relatively clean flow from the northwest. At present, it continues to extract water containing PCE and TCE several times their respective State of Maine Maximum Exposure Guidelines (MEGs) or federal Maximum Contaminant Levels (MCLs). Therefore, it is recommended that EW-3 continue to be operated. However, should contamination at this well fall below regulatory standards in the near future, this well might be considered for shutdown in favor of expending the operation and maintenance (O&M) resources on other portions of the system, particularly the new extraction well near MW-311.

5. The report provides results of analyses performed on samples taken from the extraction wells, but does not show tables or plots by which one can assess long-term trends, if present. Nor is there any correlation of concentration results to monitoring well water level, overall rainfall quantity, season variation or sustained pumping rate. The following tables summarize results from the extraction-well analyses. Data for Events 5, 6, and 7 are from Table 3-13. Only compounds showing exceedances in any of the sampling rounds are listed for each well. Exceedances are indicated by bold face numbers.

Well EW-1

Round	3	4	5	6	7	MEG	MCL
PCE	**6**	**6**	**26**	NS	**10**	3	5
TCE	**29**	**26**	**40**	NS	**41**	5	5

Well EW-2

Round	3	4	5	6	7		
PCE	**8**	**18**	**17**	**28**	NS	3	5
TCE	**25**	**46**	**16**	**42**	NS	5	5

Well EW-3

Round	3	4	5	6	7		
1,1-DCE	**40**	NS	-	-	-	7	7
PCE	**17**	NS	**17**	**21**	**22**	3	5
TCE	**18**	NS	**16**	**14**	**12**	5	5

Well EW-4

Round	3	4	5	6	7	MEG	MCL
1,1-DCE	**56**	-	NS	NS	**28**	7	7
1,1,1-TCA	**1000**	5	NS	NS	**400**	200	200
PCE	**11**	-	NS	NS	**10**	3	5
TCE	**340**	3	NS	NS	**150**	5	5

Well EW-5

Round	3	4	5	6	7		
1,1-DCE	**32**	NS	**33**	**34**	**36**	7	7
1,1,1-TCA	**510**	NS	**420**	**320**	190	200	200
TCE	**120**	NS	**94**	**130**	**81**	5	5

No definitive trends are apparent in these data. Qualitatively, it appears that concentrations may have declined, on average, in EW-4 and EW-5. This is consistent with nearby monitoring wells (see, e.g., Fig 3-24) that show, for the deeper portion of the aquifer, a general decline in TCE and total VOC, particularly since monitoring event 4. EW-1, EW-2, and EW-3 show generally lower concentrations (no exceedances greater than a factor of 10 over the guidelines), and values relatively stable through time.

6. Analytical results from the monitoring wells that have shown exceedances for VOCs are nicely summarized graphically in Figures 3-20 to 3-24. The data show considerable scatter, as is typical of results of this type, and it is difficult to draw any general conclusions.
Qualitatively, a number of wells (e.g., MW-106, MW-207A, MW-311, and MW-319 near EW-2 and EW-3, shown in Figure 3-23, and P-105, P-106, and MW-306 near EW-6) show a consistent pattern of an increase in concentration over the first few monitoring events, followed by a decline. This is suggestive of motion of the centroid of the contaminant mass toward the extraction wells. This would be expected following removal actions in the source areas, as well as ongoing transport and degradation of the VOCs.

7. It is difficult to assess the zone of influence of the extraction wells from the contour maps of the potentiometric surfaces, as shown for the shallower portion of the aquifer in Figures 3-2 to 3-7 and for the deeper portion in Figures 3-8 to 3-13. In many of the plots, the influence of some extraction wells on the groundwater potential appears to be negligible (e.g., well EW-4 on Fig. 3-8 (February 1996), Fig. 3-12 (September 1996), and Fig. 3-13 (November 1996), where the contours show a relatively flat or even slightly mounded area around the extraction well). This may be due to relatively strong regional flow that is not strongly perturbed by the extraction wells, a strong overprint of seasonal variations, or simply contouring that is speculative because of sparse data in certain subregions. Consideration should be given to collecting groundwater potential data for the entire system in an unstressed state (i.e., extraction wells off) and, shortly thereafter, in the stressed state (i.e., extraction wells on). Plots

of the change in potential between the stressed and unstressed states for the shallow and deep portions of the aquifer would provide a basis for assessing the zone of influence of each extraction well. It would give an indication of the adequacy of coverage of the extraction system, and may suggest some appropriate adjustments of the pumping rates to optimize withdrawal of contaminated groundwater.

8. Modeling of both groundwater flow and contaminant transport in the Eastern Plume is recommended as a means of supporting design of further remediation efforts (e.g., location, screen depth, and pumping rate of the new extraction well near MW-311), optimization of the operation of the extraction well network, and future decisions regarding termination or reduction of the active extraction program. Information gained from a model could be used to accurately perform an economic analysis to assess and predict the benefits of rescreening extraction wells versus contaminant mass removal and predicted required pumping duration that is discussed in specific comment 2. A wealth of data is now available from the monitoring program, so that models can be calibrated quite thoroughly. Models would allow operators, administrators, and regulators to assess various important questions such as the degree to which contaminants might be expected to be transported in the future beyond the current limits of the plume.

9. Data quality objectives for stream surface water, and sediment and leechate seep water and sediment need to be developed; to discuss this issue at upcoming meetings.

Specific Comments

1. A crude assessment of whether extraction well EW-2 captures downgradient flow in the neighborhood of MW-311 can be made from the classical analysis of capture by a single pumping well in a uniform flow field (e.g., Fetter, 1994, p. 501). The ratio of the down-gradient distance from the extraction well to the stagnation point (or maximum down-gradient distance for capture) to the up-gradient width of the capture zone is ½ pi. In the present case, the extraction wells are separated by an average distance of about 800 feet. Assuming that the capture zone width is equal to the well spacing, the stagnation point for each extraction well would lie about 130 feet downgradient. The distance from EW-2 to MW-311 is over 400 feet. Thus, one must conclude that MW-311 lies well beyond the influence of EW-2. This would hold even if the design and operation of the extraction wells is such that they are spaced at only half the expected capture-zone width.

2. It is understood that a new extraction well is planned for the neighborhood of MW-311. Consideration should be given to well designs that will allow some flexibility in testing various extraction schemes. The design of the current extraction wells, which are screened across the entire aquifer, results in extraction of a large fraction of relatively clean water. However, most of the contaminant mass is in the deeper portion of the aquifer. A screen installed only across the deeper portion of the aquifer would focus extraction in this stratum. On the other hand, it is noted that direct-push sample DP-02 in this area showed exceedances of 1,1,1-TCA, 1,1-DCE, and TCE in the shallow portion of the aquifer (Fig. 3-16; Table 3-9), so that it may be desirable to extract from the shallow aquifer, as well. Consideration might be given to a well design with

separate screens installed in the shallow and deep zones. The sand packs adjacent to each screened section would be separated by grout. In this configuration, the extraction could be limited to the deep zone by means of a packer, or the extraction could be extended to the shallow zone without the packer. This design would allow some flexibility in extraction schemes..

3. P. 4-10, second bullet: The report alludes to natural attenuation as a possible future strategy for reduction of VOC in the Eastern Plume. This is an appropriate topic for discussion, as suggested. Such a discussion should take place as soon as possible, particularly with regard to data requirements, because the present monitoring plan can provide information important to evaluation of natural attenuation for the site. The present monitoring can easily be expanded to provide relevant data. In particular, the discussion should include consideration of analyses for oxidation potential (Eh), dissolved oxygen, alkalinity, and various redox couples (e.g., nitrate/nitrite and ammonia, sulfate and sulfide, ferric and ferrous iron, and manganese, both manganic and manganous). The iron and manganese should be analyzed on filtered samples.

4. Table 3-7, MW-218. Arsenic levels consistently above the MCL of 50 ppb with no clear trend are noted. Year to year, seasonal variation was not investigated.

5. Table 3-18, sample point LT-1 (leachate sediment). Mercury concentrations above the ROD cleanup level of 1 ppm with no discernable trend are noted. Year to year, seasonal variation was not investigated.

Reference

Fetter, C. W., 1994, Applied Hydrogeology, Macmillan, New York, 691 p.